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Membrane Separation

Development activity targets high-volume industrial uses

Page 7

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News of the Week

■ **Two independent reports issued last week on the AIDS crisis recommend legislation to ban discrimination based on HIV infection and other federal policy moves to combat the disease.** **Page 4**

■ **W. R. Grace pleads guilty to supplying false information to the Environmental Protection Agency on the amount of acetone it purchased and used at its Cryovac Division plant in Woburn, Mass.** **Page 5**

■ **Bilateral agreements that expand cooperation in science and technology were announced at last week's U.S.-Soviet summit in Moscow.** **Page 5**

■ **Koppers, a Pittsburgh-based construction materials and chemicals producer, accepts a $1.8 billion bid from British construction firm Beazer.** **Page 6**

■ **Cotton fibers are grown in solution from isolated cotton plant cells; the product may have commercial potential as microbe-free fiber for specialty applications.** **Page 6**

Cover: Air Products Separex membrane gas separation system installed at a natural gas production facility in Louisiana

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Business

Revenues continued to climb for many biotechnology firms in the first quarter on the strength of research contracts and higher product sales, but most companies have yet to turn a profit. **Page 19**

Government

Controversy besets USDA's Agricultural Research Service over the appointment of its new administrator. **Page 22**

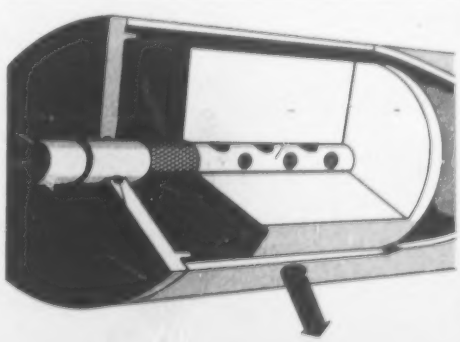
Technology

Process for injection molding of magnesium alloys, which resembles injection molding as practiced in the plastics industry, is developed by materials scientists and engineers at Dow Chemical. **Page 29**

New gallium arsenide solar cell converts sunlight to electricity with 28.1% efficiency, the highest conversion efficiency yet achieved by GaAs cell. **Page 30**

Books

"Nothing To Lose but Our Lives: Empowerment To Oppose Industrial Hazards in a Transnational World," edited by David Dembo et al., is a collection of critiques of U.S. chemical industry safety. **Page 31**



News Focus

Major breakthroughs in the development of membrane materials have led to the commercialization of a new generation of membrane separation systems for large-scale industrial applications. **Page 7**

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LETTERS

Investigating AIDS

SIR: In the article by Rudy M. Baum, "Research on AIDS Moving Quietly Forward" (C&EN, March 28, page 29), the reference to the work and opinions of James I. Mullins and Jay A. Levy, as related to acquisition of AIDS via intestinal human immunodeficiency virus (HIV) infection, brought to mind a possible mechanism to explain the spread of AIDS by anal sex intercourse, not mentioned in any reports I have seen on the subject. This mechanism is that the mucolytic enzyme factor (hyaluronidase) in sperm cells, employed for penetration of the ovum surface in fertilization, may abet the HIV infection through its penetration of the mucous coating and cell surfaces of the intestine.

A simple animal test of the mechanism of infection might be anal introduction of hyaluronidase in a suitable solution into the lower intestinal tract with and without HIV, and also of a solution of the HIV without the enzyme. The effect of accompanying such tests with rubbing the mucosal surface, in simulation of anal intercourse, may be unnecessary, as Levy, in the article cited, discounted these friction or trauma factors in the infective process.

Having been retired from laboratory work for some time I am not in a position to undertake this study, but I offer these suggestions in the hope that they will be investigated.

David Glick
Professor Emeritus, Pathology
Stanford University

Technology free trade

SIR: The article, "U.S., Japan Approach New Era in Science and Technology Relations" (C&EN, April 11, page 13), correctly points out that the society and culture of the U.S. promotes creative research, whereas the authoritarian culture in Japan sustains excellence in product development and commercialization. Unfortunately, free trade between the U.S. and Japan has resulted in a loss by the creative culture (the U.S.) of its manufacturing base.

Naturally, if our nation loses enough of its manufacturing capacity to other countries, it will also lose its freedom of self-determination. And when that happens, we will lose the free-thinking culture that promotes creative research.

In order to protect our research and development institutions from eventual decline into technical mediocrity, our nation must aggressively defend intellectual property rights, and tax the export of technology from our nation. By restricting the flow of technology, we will keep more of the technical resources that our culture spawns and that vitalize domestic manufacturing.

Although the present, unbridled export of technology might appear to be a boon to our R&D institutions, our technical leaders must acknowledge that over the long haul, the free trade of technology undermines the wellspring of our R&D capabilities.

Robert Fireovid
Justice, Ill.

Quality chemists

SIR: John R. Wasson (C&EN, March 21, page 5) expresses several valid arguments concerning the employment problems facing U.S. chemists and the need for quality over quantity in our chemical professionals. His insights on the state of academic research on the university level are quite accurate, and his proposals, while likely to be viewed as elitist and nationalist, would aid in streamlining the system and in producing better-trained chemists to fill entry-level positions. However, much of Wasson's commentary also reflects a somewhat narrow-minded and self-serving bias.

Although it is true that professional chemistry is not where the bucks are, the field does indeed offer its own special rewards. It is, nonetheless, only human nature to want to perform in a job that best suits one's capabilities and stimulates one's interests, and to receive the best compensation possible for one's efforts. The chemical profession is right in wanting the best and brightest for its ranks; unfortunately in many instances the system that seeks to produce them instead discourages aspirants to the fold. The current publish-or-perish mentality in academe requires maximum results from a professor's research efforts in order to ensure tenure and increase the influx of grant money. Often this prevents professors from providing the supervision necessary to adequately train graduate students in advanced laboratory techniques, whether directly or via their postdoctoral associates. As a result, it is often the case that graduate research advisers seek students who have gained experience either in industry or in other graduate programs, either as transfer students or M.S.-level chemists. In turn, graduate laboratory assistants generally do not encourage their undergraduates to learn technique and to gain the insight necessary to under-

Revenues Still Rising For Biotechnology Companies

Research contracts and increased product sales bolstered revenues for many firms in first quarter; profits remain elusive for most firms

Research contracts continued to help biotechnology firms increase their revenues in the first quarter of 1988. And in some cases, most notably Genentech, product sales helped swell revenues and profitability well above the year-earlier results.

Combined revenue of the 18 companies sampled by C&EN increased 48% to a total of $198 million in the first quarter of 1988 compared with last year's first quarter. As a composite, the group registered a profit; combined earnings amounted to $2.3 million compared with a loss of $331,000 in the first quarter of 1987.

Many of the firms sampled are still actively in pursuit of the products and patents that they hope will ultimately make them profitable. Food & Drug Administration and Environmental Protection Agency approvals have allowed some to approach their goals.

In some cases, however, the most profitable companies have become victims of their own success. Genentech, the darling of publicly traded biotechnology stocks, has seen its stock price decline over the past year despite the successful introduction of its Activase tissue plasminogen activator, a blood clot-dissolving agent used to treat heart attack victims. According to Linda Miller, an analyst with Paine Webber, the success of Activase has overshadowed Genentech's other major pharmaceutical products, such as human insulin, human growth hormone, and α-interferon.

Genentech is thus "viewed as a one-product company," says Miller, and "is now valued in comparison to other pharmaceutical companies." But without the earnings or visibility of other pharmaceutical stocks, Genentech, which has "a superior rate of growth, is receiving a discounted value in the market."

The firm's Activase may have some problems, too. Because it now costs $2200 per dose, some analysts note that government resistance to paying the full cost of the drug under Medicare may limit the drug's earnings potential. "They may have to reduce the price," points out David Webber, an analyst with Jeffrey Casdin & Co. "Most people," he adds, "were disappointed with [Genentech's] first-quarter sales and feel they have not increased tremendously."

Genentech's chief executive officer Robert A. Swanson counters that "At the beginning of the quarter, approximately 1000 patients per week were receiving Activase for the treatment of heart attacks. By the end of the quarter, that number had doubled." He adds: "We are pleased by the exceptional clinical effectiveness of Activase."

Of the $74.4 million in total revenues Genentech reported in the first quarter, $63.5 million was from product sales. In last year's quarter, Genentech had product sales of only $16.5 million out of total revenues of $38.6 million. Genentech's prod-

Revenues up an average of 48% for 18 biotech firms

	FIRST-QUARTER 1988					
	Revenues[a]	Earnings[b]	Change from 1987		Profit margin[c]	
	($ millions)		Revenues	Earnings	1988	1987
Amgen	$14.573	$0.488	37%	110%	3.3%	2.2%
Applied Bioscience	10.431	0.883	50	44	8.5	8.8
Applied Biosystems	37.323	5.135	74	149	13.8	9.6
Biogen	6.747	−0.935	60	def	def	def
Calgene	9.163	0.044	25	−88	0.5	4.1
Centocor	15.721	1.993	31	29	12.7	12.9
Cetus	16.610	−6.974	22	def	def	def
Collagen	7.512	−0.664	12	def	def	11.6
Cytogen	1.792	−3.125	−29	def	def	def
DNA Plant Technology	1.540	−0.355	−15	def	def	def
Genentech	74.424	15.211	93	235	20.4	11.8
Genetics Institute	2.630	−5.993	−50	def	def	def
Immunex	5.155	0.596	44	def	11.6	def
Integrated Genetics	3.436	−0.923	1	def	def	4.0
Liposome	1.518	−0.550	69	def	def	def
Molecular Genetics	1.421	−0.384	−36	def	def	def
Ribi ImmunoChem	0.339	−0.468	−21	def	def	def
Synergen	1.749	−1.180	−22	def	def	3.6
TOTAL	$197.511	$2.311	48%	def	1.2%	def

a Includes sales, contract research, royalty, and interest revenues. b Excludes extraordinary and nonrecurring items where possible. c After-tax income as a percentage of sales. def = deficit.

uct sales have grown 285% while total revenues have grown only 93%. Total earnings after taxes have grown a spectacular 235% for the company—proof of the kind of profits a "blockbuster" biotechnology breakthrough can help a company realize.

Amgen, which may soon receive FDA approval to market erythropoietin (EPO), a product that enhances the production of red blood cells and thus is used for treating certain types of anemia, may come under product price resistance similar to Genentech's experience with Activase. Webber says he estimates EPO's average annual cost per patient at $2000 and thinks the company also may have to reduce the estimated price of its product, making for a longer period to recover development cost and cutting into profit potential.

For the moment, though, Amgen is among the profitable biotechnology companies in C&EN's survey. Its revenues, mostly derived from research contracts, totaled $14.6 million in the first quarter, up 37% from last year's first quarter. Earnings climbed 110% to $488,000.

Amgen chairman, president, and chief executive officer George B. Rathmann is sanguine about the company's successes so far. "We have advanced each of our major product programs closer to the marketplace, continued to pursue an aggressive program of new product discovery and development while still maintaining a strong financial profile. We look forward to continued success as Amgen establishes itself as a leading contributor to the biotechnology industry," he says.

One biotechnology company reported strong first-quarter earnings for an unusual reason. Applied Bioscience president and chief executive officer Kenneth H. Harper says that about half of the company's earnings boost came from currency translation gains due to the appreciation of the British pound against the U.S. dollar. Applied Bioscience is the parent company of Bio/Dynamics of East Millstone, N.J., and Life Science Research of Suffolk, England.

A number of biotechnology companies have found it difficult to secure new research contracts and financing since the October stock market crash. These firms continued to show losses because they were either funding more of their own research or were financing clinical testing of proprietary new drugs.

Larry Soll, president and chief executive officer of Synergen, says, "In line with our increased emphasis on self-funded programs, our spending for proprietary research and development more than doubled during the first quarter of 1988 compared to the same period in 1987."

Ribi ImmunoChem's president and chief executive officer Robert E. Ivy says the "increased loss reflects accelerated clinical testing to hasten our products to market." And Cytogen says that costs of an investigational new drug application for Onco-Rad, an antibody linking agent that aids targeted radioisotope treatment of tumors, represented significant operating expenses.

Marc Reisch, New York

Correction of chemical sales and earnings data

Some lines were inadvertently transposed in the 12-month running data that appeared in the table containing first-quarter sales and earnings results (C&EN, May 16, page 12). Below is the entire corrected section of the table, so readers may have a clear and comprehensive picture of company results.

	12-MONTH RUNNING DATA			
	Change from 1987		Profit margin[a]	
	Sales	Earnings	1988	1987
Air Products	11%	31%	8.4%	7.1%
American Cyanamid	10	23	6.3	5.6
Arco Chemical	30	79	14.7	10.6
Aristech	27	58	8.1	6.5
Betz Laboratories	15	18	10.4	10.2
Cabot	−6	−22	4.2	5.1
Chemed	1	17	5.2	4.5
Crompton & Knowles	5	44	5.3	3.8
Dow Chemical	24	85	10.5	7.0
Ethyl	14	9	11.0	11.6
First Mississippi	25	359	6.3	1.7
H. B. Fuller	21	36	4.1	3.6
Georgia Gulf	108	356	14.8	7.1
B. F. Goodrich	−2	189	5.0	1.7
W. R. Grace	27	def	3.5	def
Hercules	2	−4	7.4	7.9
International Flavors	21	27	14.6	14.0
International Minerals	4	def	5.3	def
Loctite	28	32	9.6	9.3
Lubrizol	6	−11	6.2	7.4
Monsanto	13	58	6.4	4.6
Nalco Chemical	18	44	9.8	8.1
Olin	17	60	4.1	3.0
Pennwalt	11	7	4.4	4.5
Petrolite	10	3	5.5	5.8
Quantum Chemical	21	169	7.8	3.5
Rohm & Haas	11	7	8.7	9.1
Union Carbide	12	69	3.7	2.5
Vista Chemical	28	52	12.1	10.2
Witco	11	14	4.9	4.8
Total 15 larger firms	15%	61%	7.3%	5.2%
Smaller 15 firms	18%	67%	8.1%	5.7%
GRAND TOTAL	16%	62%	7.4%	5.3%

a After-tax earnings as a percentage of sales. def = deficit.